

AbstractID: 5727 Title: Comparison of amplitude-based and phased-based binning techniques for respiratory correlated CT

Purpose:

To evaluate amplitude-based and phase-based approaches for generating respiratory correlated CT (RCCT) images in terms of spatial coherence and residual motion artifacts.

Method and Materials:

A programmable robot arm (Kawasaki, FS-2, KRI, Wixom, MI) with an attached phantom consisting of 3 – 6 cm. diameter spheres was used to simulate various breathing patterns. Both the Varian RPM system and a bellows device were used as surrogates for monitoring. The robot arm was commanded to perform asymmetric “exhale/inhale” sequences with a variable cycle time, and it allowed for multi-axis trajectories, hysteresis and pseudo-random motion. The effectiveness of amplitude-based and phase-based binning algorithms on the resultant images of a spherical phantom was quantified by calculating the average deviation from a spherical surface. Both binning methods were applied to patient data sets and qualitatively evaluated.

Results:

Amplitude-based binning produces fewer artifacts, especially when the breathing frequency was varied during the acquisition. When using phase-based techniques the measured radii of spherical objects had twice the variance as compared to amplitude-based algorithms.

Conclusion:

Amplitude-based binning has merit in generating RCCT image volumes. Preliminary results suggest that they generate fewer artifacts and are more accurately correlated to the internal organ motion, especially when the breathing frequency varied during the acquisition. More investigation is warranted to evaluate the impact of this new methodology on treatment planning and delivery.

Conflict of Interest (only if applicable):

The author is an employee of Philips Medical Systems